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U.S. Bureau of  
Reclamation  
Hoover Dam

[Washington]

[1947]

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## TECHNICAL MICROFORM DATA

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# Hoover Dam



UNITED STATES DEPARTMENT OF THE INTERIOR  
Bureau of Reclamation

## History

THE ORCA WILD Colorado River has been tamed. Now it is doing man's work, bringing untold wealth to the vast agricultural and industrial Southwestern empire which it has helped to create.

Completion of Hoover Dam in Black Canyon closed an initial chapter in man's long effort to harness the resources of one of the world's most treacherous rivers. Since the Spaniards discovered the Colorado in 1540 until the completion of the dam in 1936, the river offered neither a desirable all-year route for exploration nor a dependable source of water for those who sought to irrigate farms or produce power.

The lands in the Imperial Valley of California and in southwestern Arizona needed only irrigation water to become fruitful. This, men were lured by the waters of the river to seek their fortunes in these areas.

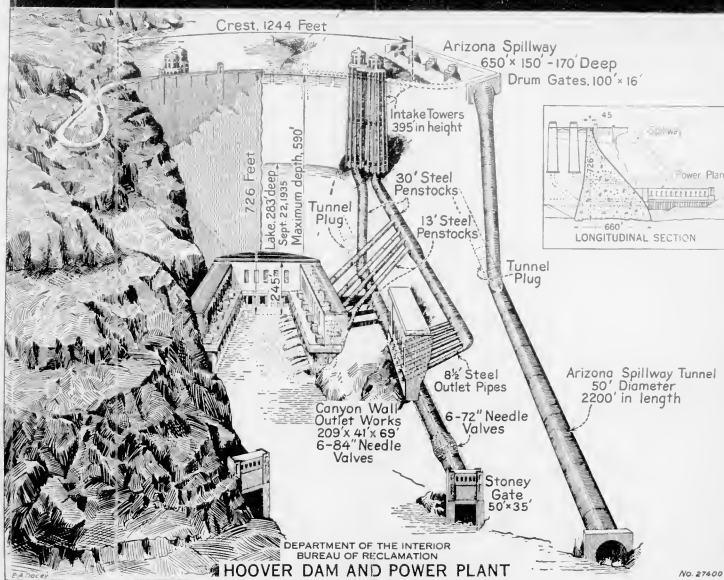
The river was tapped for water to irrigate the land. But in its uncontrollable state, the mighty stream took its vengeance upon the hopeful farmers. Spring floods repeatedly washed away their crops. Then, tantalizingly, the river during the late summer and fall faded to a mere trickle as if in derision of man's pitiful efforts.

The pioneers were not easily discouraged. They dared to dream of a day when the river would be made to do their bidding. Cries arose for control and conservation of the river's resources. As each early attempt ended in failure, the people demanded action. In 1922 representatives of the Federal Government and of the seven States in the Colorado River Basin met at Santa Fe, N. Mex., to draft a compact for the division of the Colorado's waters.

In 1928 the Congress passed the Swing-Johnson bill—known as the Boulder Canyon Project Act—authorizing the Boulder Canyon project. The compact was ratified by 1930, and construction of Hoover Dam was begun by the Bureau of Reclamation in 1931. The dam was completed 5 years later, and, for the first time in history, man had succeeded in controlling the Colorado River. On April 30, 1947, the Congress enacted Public Law 43, which officially changed the dam's name from Boulder to Hoover.

Today Hoover Dam stands as a mighty sentinel, keeping guard over the entire lower river basin. Lying calmly behind the dam are the blue waters of Lake Mead—waters which once carried destruction and devastation. Crossing the mountains and deserts are columns of transmission lines which deliver billions of kilowatt-hours of electric energy to the industries of the growing Southwest. Downstream the river offers its waters for the irrigation of thousands of fertile farms and to millions of people in the coastal cities for domestic use. These benefits are the real significance of Hoover Dam.

## How Hoover Dam Works . . .



THIS DRAWING shows how Hoover Dam works. The Nevada wall of Black Canyon of the Colorado River is shown solid, but the Arizona wall has been cut away to reveal the intake towers, the spillway, the penstock pipes, and outlet works. Inside the Nevada wall of the canyon a similar set of diversion works has been placed. Principal dimensions are shown.

The powerhouse, here shown dwarfed in the bottom of the canyon, is two city blocks long

and as high as a 20-story building. Twelve units rated at 82,500 kilowatts, one at 40,000, and two 2,400-kilowatt station service units, bring the present installed capacity to 1,034,800 kilowatts. Space is available for installing three more 82,500- and one 30,000-kilowatt units, which will raise the capacity to a total of 1,332,300 kilowatts.

The tunnels originally used to divert the Colorado River around the dam site during the

period when Hoover Dam was under construction, now are used in the penstock and outlet system for the greater part of their lengths. They have been plugged upstream from the points at which the continuously useful outlets enter them, as can be seen in the drawing.

A roadway across the crest of the dam forms an important link in the transcontinental highway system.

## Achievements

Hoover Dam is a versatile, multiple-purpose giant with equally vital achievements in hydropower production, irrigation, flood control, city water, recreation, and wildlife preservation.

Its hydroelectric power and irrigation waters are the backbone of a highly developed economy which has created a valuable market for the products of farms, mines, and factories of the Nation. And the structure stands as a bulwark against the great main-stream floods that ravaged the lower reaches of the Colorado River.

Energy which is generated at Hoover Dam has helped to make possible the huge industrial development and vast population increases in the Los Angeles area. Today Los Angeles leads the Nation in the production of aircraft and oil-field equipment. It ranks second in automobile assembly and production of rubber goods.

Hoover Dam stepped up its wartime energy output 50 percent to drive more than half of the war plants in southern California, southern Nevada, and Arizona. Its overloaded generators ran steadily to keep wheels turning in shipyards, airplane factories, mines, rubber works, and the great Basic Magnesium plant. Hoover Dam generated more than 16 billion kilowatt-hours of wartime electrical energy. Peace brought no let-up in the demand for its power.

Over half a million desert acres in southern California and Arizona have become a land of perpetual harvest since Hoover Dam has released a dependable irrigation supply. Fresh fruits and vegetables grown there are shipped in the winter to virtually all of the United States.

The All-American Canal, a part of the Boulder Canyon project, serves more than 400,000 acres in the rich Imperial Valley of California. An additional 75,000 to 80,000 acres in the Coachella Valley will ultimately receive Colorado River water from the recently constructed Coachella Main Canal, a branch of the All-American System. When the Gila project near Yuma, Ariz., is completed, 115,000 acres there will receive water. Some 56,000 acres on the Yuma project, 2,000 acres on the Yuma auxiliary project, 56,000 acres in the Palo Verde Valley, and 15,000 acres of Indian lands near Parker, Ariz., were irrigated with Colorado River water in 1949.

Food and fiber grown with Hoover-conserved water made a great war contribution and will continue to provide peacetime wealth.

A large new recreational area has been created by the dam, which is visited by nearly a million people each year. Good fishing and other wildlife attractions abound. Under supervision of the National Park Service, recreational facilities are steadily improving at Lake Mead.

Primarily as a result of Hoover Dam, Colorado River water is available to 28 cities in southern California served by the Metropolitan Water District's aqueduct. A branch of the aqueduct reaches to San Diego.

## GUIDED TOUR

THE BUREAU of Reclamation maintains guide service facilities through the dam and power plant every day of the year. The dam is open between the hours of 8 a. m. and 5 p. m.

### IRRIGATION

Water is the lifeblood of the arid West. Without irrigation, agriculture is almost impossible. For large acreages below Hoover Dam receive only a few inches of rainfall annually. Several hundred thousand acres are already irrigated and in production.

The warm winters and regulated water supply have combined to make this section of the country an outdoor greenhouse from which trainloads of vegetables roll to northern and eastern markets during the winter months. Large field-scale production of such garden crops as lettuce, cabbage, carrots, melons, cantaloupes, and other vegetables and fruits, plus special trains of refrigerated cars, have brought midwinter variety to family tables all over the Nation. Other specialty crops grown under dependable year-round irrigation include dates, tangerines, and grapes. Large acreages of alfalfa, flax, and other field crops, as well as cattle brought from arid ranges for feeding, are less dramatic but quite important for a balanced irrigation farming.

In 1949 the Palo Verde Valley, 200 miles downstream from Hoover Dam: the Yuma and Gila projects, another 100 miles downstream: the Imperial Valley irrigation district 80 miles to the west in California; and the Coachella Valley north of the Salton Sea—had more than a half million acres under cultivation.

Development is continuing on the Gila project in Arizona where 50,000 acres were under irrigation in 1949, and in the Coachella Valley where 24,000 acres were irrigated during the same year. In both of these areas, water pumped from wells was used on much of the land, but underground supplies are rapidly being depleted. Moreover, on part of the Gila project, well water is becoming too salty for continued crop production. When construction now underway is completed, 115,000 acres on the Gila project and 75,000 to 80,000 acres in the Coachella Valley will receive Colorado River water from the mighty storage reservoir behind Hoover Dam.

Parties are taken through the huge structure and an explanatory lecture is given by the guide while on tour. In addition to the guided tour of the dam, an exhibit building is open to the visitor.

### POWER

Hoover Dam is one of the world's largest hydroelectric power producers. Of basic importance is the fact that the power is costless, serving as a boon to industrial expansion and to ease the daily burdens in thousands of homes. The ready sale of this energy is the primary factor which has made the project financially successful.

The U-shaped power plant nestles at the foot of the dam. The late President Franklin D. Roosevelt started the first generator on September 11, 1936, by turning a golden key in Washington.

Now installed, or on order, in the power plant are 14 generators each rated at 84,500-kilowatt capacity, one 40,000-kilowatt unit, one 50,000-kilowatt unit, and two 24,000-kilowatt auxiliary service units. These will provide a generator capacity of 1,229,800 kilowatts, and they are driven by turbines totaling 1,742,000 horsepower. Space is reserved in the Nevada wing of the plant for an additional 82,500-kilowatt unit.

Hoover Dam's hydroelectric plant is capable of producing enough electrical energy to meet the combined needs of the cities of Boston, Pittsburgh, and Washington, D. C. With all units installed, its capacity will be sufficient to meet the combined energy requirements of Detroit and Los Angeles.

The United States has executed contracts for disposal of all of the firm and secondary energy generated at the plant until 1987. The firm energy output now approximates 4 billion kilowatt-hours annually, and it has been estimated that 841 million kilowatt-hours of secondary energy will be available each year until 1987, which is the end of the amortization period.

The city of Los Angeles and the Southern California Edison Co. operate the generating equipment under contract.



From steel-reinforced



to Boulder City

## BOULDER CITY

Boulder City, Nev., is one of the most unusual towns in America. Located on a summit 2,500 feet above sea level, about seven miles west of the dam, it is truly a desert oasis. With a population of about 4,000, it is modern in every respect, with schools, churches, homes, tree-lined streets, spacious parks, and thriving business establishments.

Boulder City was designed as a construction camp for the personnel engaged in building Hoover Dam, but, unlike the usual construction camp, it was planned to afford all necessary conveniences to its residents. Modern conveniences were designed for the town from the very beginning. The rough desert was leveled and landscaped, trees and lawns were planted, and a water supply provided. The water system includes a modern filtration and treatment plant. Modern sewage and lighting systems were installed.

Engineers who planned the town recognized that the high summer temperatures required buildings designed and equipped to provide maximum comfort during the summer months. Therefore, practically all summer buildings are of the Spanish or Mediterranean style, with flat roofs and arched windows, and are air-conditioned. The winters are mild and many houses are heated entirely by electricity.

All land in the town is owned by the Federal Government, and it is leased to home owners or those awarded business permits. Thus, the Government retains ownership and supervisory control. Since the Government retains ownership of the land, no land taxes are levied, but land rent is collected in lieu of taxes. Administrative responsibility of the town rests with the Director of Power of the Boulder Canyon project.

Today, visitors to Boulder City find a man-made oasis in the heart of a barren desert, symbolic of all Reclamation services.



Boulder City, oasis of the Western desert, is one of America's most modern towns

## DOMESTIC WATER

The aqueduct of the Metropolitan Water District, taking off at Barker Dam, 150 miles downstream from Hoover Dam, delivers water from Havasu Lake to Los Angeles and to 27 other coastal municipalities. The San Diego aqueduct, constructed by the Navy Department in 1945 and 1946, taps the Metropolitan Water District's aqueduct at the outlet of the San Jacinto Reservoir, and delivers water to the San Vicente Reservoir, a part of the San Diego city water supply system.

Water diverted through the \$220,000,000 aqueduct from Havasu Lake is available and useful only because Hoover Dam has regulated and harnessed the Colorado River. Without this ample water source, it would not have been possible for the coastal cities to accommodate the enormous influx of people and industry during the war. The aqueduct could supply sufficient water for the needs of a population almost double that now living in southern California.

The aqueduct of the Metropolitan Water District, taking off at Barker Dam, 150 miles downstream from Hoover Dam, delivers water from Havasu Lake to Los Angeles and to 27 other coastal municipalities. The San Diego aqueduct, constructed by the Navy Department in 1945 and 1946, taps the Metropolitan Water District's aqueduct at the outlet of the San Jacinto Reservoir, and delivers water to the San Vicente Reservoir, a part of the San Diego city water supply system.

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The Boulder Canyon project has contracts to furnish power to the cities of Los Angeles, Pasadena, Burbank, and Glendale; the Metropolitan Water District of Southern California; the Southern California Edison Co., Ltd.; the California Electric Power Co.; and the States of Arizona and Nevada. The project also serves power to Boulder City.

Contracts have been made with various State and local bodies for storage and delivery of water from Lake Mead.

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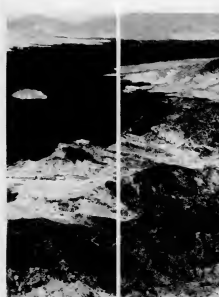
## LAKE MEAD

Beautiful Lake Mead, with its 350 miles of shore line, was named for the late Dr. Elwood Mead, Commissioner of Reclamation from 1934 to 1936. This tremendous reservoir, created by Hoover Dam, under peacefully among the magnificent canyons along the Colorado River. Boulder, Travertine, Iceberg Canyons, and the lower end of Grand Canyon, defied nearly 11 of man's attempts to reach them prior to the building of Hoover Dam. Now they are easily accessible by boat up the tilled waters of the lake and river. The rugged and colorful

walls of the canyons, towering as much as a mile overhead at certain points along the river, are truly among the greatest scenic wonders of the world.

The long warm season of the year attracts thousands of recreationists to the dam and lake for swimming, boating, and fishing. With its sandy beaches, its boat concessions, and beautiful stocks of fish, the lake offers unusual opportunities in all water sports.

The recreational area on and around the lake is under the supervision of the National Park Service.



Lake Mead lies quiet, but never idle, in the Colorado River canyons behind Hoover Dam

## RIVER FLOW

Snows in the mountain are melted in the spring, sending torrents of water down the Colorado River. As much as 25,000 cubic feet of water per second have been known to flow down the river, and there is evidence of floods as great as 300,000 second-feet. With a capacity of 31,047,000 acre-feet (an acre-foot being sufficient to cover an acre 1 foot

deep), Lake Mead can impound about twice the average annual flow of the river. Before construction of Hoover Dam, the river dried to a trickle during the long, dry seasons of summer, fall, and winter. Now the river below Hoover Dam is controlled throughout the year, thus insuring a stable water supply the year round.



Water makes farming possible



Power makes living worth while

## POWER AND WATER PAY THE BILL

LIKE ALL Reclamation multiple-purpose projects, Hoover Dam is a self-supporting venture. The total cost of the dam and power plant is being repaid to the United States Government almost entirely through the sale of electrical energy. A small contribution toward repayment is being made through water-storage charges.

The estimated cost of constructing the dam, power plant, and appurtenant works totals \$1,909,000, of which \$25,000,000 has been allocated to flood-control facilities.

The major part of the nonflood costs is to be repaid, with 3 percent interest, over a 50-year period ending June 1, 1987. The remainder of these costs pertain to purchase and installation of power generating machinery and equipment, and are to be repaid, with 3 percent interest, over 50-year periods starting at such times as the facilities were first put into service. Repayment of the flood-control costs has been deferred, without interest, until after June 1, 1987.

Hoover Dam's earnings are financing payments of \$800,000 per year each to Nevada and Arizona, in lieu of taxes, over a 50-year period. Furthermore, \$500,000 per year goes to the Colorado River Development Fund for surveys and further Colorado River developments.

As of May 31, 1949, Hoover Dam had paid the Treasury of the United States a total of \$5,056,300 for application to interest and principal, including advance payments by certain allottees.

The 1948-49 gross power revenues were approximately \$8,000,000. Operation and maintenance costs, reserves for replacing project facilities, and amortization of generating facilities are all financed from revenues received.

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Industrial use of power: to pay pay costs

## ALL-AMERICAN CANAL, NATION'S GREATEST, MAKES DESERT LANDS PRODUCTIVE

THIS, America's greatest irrigation canal, serves 400,000 acres of rich desert land in the Imperial Valley, one of the most productive areas in the world. Another 75,000 to 80,000 acres of land in the Coachella Valley will receive Colorado River water when acreage to be served by the Coachella Main Canal, a branch of the All-American Canal, and its distribution laterals is brought under cultivation.

Although tapping the Colorado River at Imperial Dam, 300 miles downstream from Hoover Dam, this great canal system is a part of the Boulder Canyon project approved by the Congress in 1908. Started in 1934, the canal was in operation in 1949, in time to contribute to the Nation's record war food production. Built by the Bureau of Reclamation, the All-American Canal System includes Imperial Dam and deslting works, the 80-mile-long All-American Canal, and the 137-mile Coachella Canal now under construction.

The Imperial Dam and deslting works have been designed to divert and desilt a maximum of 15,135 cubic feet of water per second, which is equal to the flow of a good-sized river. These power drops along the canal are utilized to generate electrical energy.

The canal of sky-blue water is an impressive sight as it winds across the desert from Imperial Dam south to a point near the Mexican border. It then winds west just north of the international boundary, extending to the western edge of the irrigated section of the Imperial Valley in southern California. Part of this route is through a ridge of shifting sand hills, 10 miles wide, which challenge the utmost skill and ability of the engineers during construction. Farmers along



of the All-American Canal being built to carry precious water to thirsty land



The All-American Canal winds through lands made productive by its life-giving cargo—water

the canals and laterals who use water from the canal will pay for this expenditure in interest-free installments over a period of years.

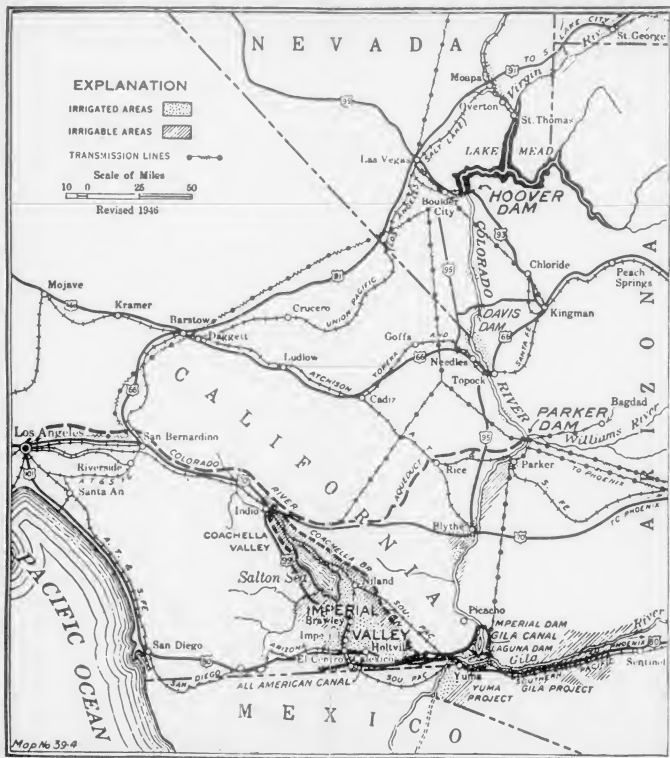
The great expanse of green alfalfa and lettuce fields, the rows of cantaloupes, grapes, and other crops along the canal, are quite a contrast to the barren valleys of early days. In December 1905 the untamed Colorado River broke through, and for 17 months poured its floods across the fertile Imperial Valley farm lands, causing untold damage and creating the Salton Sea. Today the New River Gorge and the gleaming sea remain as reminders of the river's menace.

Now the Imperial Valley each winter, when farm lands in other areas are idle, ships vast amounts of fresh produce to markets all over the Nation. It is one of the few areas in the Nation enjoying a 12-month growing season. Because of irrigated lands such as the Imperial Valley, All-American canals grow foodstuffs throughout the year at reasonable prices.

The All-American Canal furnishes the Imperial Valley with a life-free, reliable water supply. The canal runs nearly half its length through irrigated lands that once were barren deserts—a tribute to man's ingenuity in working hand in hand with nature. The old All-American Canal, which loops through territory of the Republic of Mexico, formerly supplied water for lands on both sides of the border. With completion of the All-American Canal, the All-American supplies water solely on lands in Mexico and, by terms of the recently ratified treaty with Mexico, that country will receive water from the All-American Canal at certain seasons of the year.



Controlled water disposal prevents floods



## You will want to know that . .

- Hoover Dam is the world's highest dam.
- Lake Mead is the world's largest reservoir.
- Elevators descend from the dam's crest 528 feet, equal to a 44-story building.
- Maximum water pressure on the dam's base is 45,000 pounds per square foot.

### If Statistics Interest You [ULTIMATE INSTALLATION]

Hoover Dam is . . . 726.4 feet high.  
Its crest is . . . 1,244 feet long.  
At top it is . . . 45 feet thick.  
At bottom it is . . . 660 feet thick.  
Concrete content of dam . . . 3,250,000 cubic yards.

Lake Mead is . . . 113 miles long.  
Its capacity is . . . 31,047,000 acre-feet.  
Flood-control reserve . . . 9,500,000 acre-feet.  
Maximum depth . . . 536 feet.  
Lake Mead covers . . . 146,500 acres.

Power-plant capacity . . . 1,850,000 horsepower.  
Large generators . . . 13  
Capacity of each . . . 82,500 kilowatts.  
Small generators . . . 2  
One of . . . 40,000 kilowatts.  
One of . . . 50,000 kilowatts.  
Large turbines . . . 13  
Each of . . . 115,000 horsepower.  
Small turbines . . . 2  
One of . . . 70,000 horsepower.  
One of . . . 55,000 horsepower.

Spillways . . . 2  
Capacity of each . . . 200,000 cu. ft. a second.  
Drum gates each . . . 100 by 16 feet.  
Spillway tunnels . . . 2  
Diameter of each . . . 50 feet.

Intake towers are . . . 395 feet high.  
Diameter of each . . . 75 feet.  
Capacity of outlets . . . 90,000 cu. ft. a second.  
Excavation totaled . . . 6,480,000 cubic yards.  
Steel and metal used . . . 96,000,000 pounds.  
Valves, gates, hoists . . . 33,000,000 pounds.  
Steel in penstocks . . . 89,000,000 pounds.  
Total concrete . . . 4,360,000 cubic yards.

END OF  
TITLE